CLAIMS

1. A base plate for a power module comprising:

a metal plate;

a ceramic base plate joined to the metal plate; and

a release agent provided in a joint surface between the metal plate and the ceramic base plate, wherein

a remaining amount of the release agent is less than 5 as an amount of boron measured by fluorescence X-ray analysis, and

a crystal grain straining region in the joint surface is equal to or less than 40%.

2. A base plate for a power module comprising:

a metal plate;

a ceramic base plate joined to the metal plate; and

a release agent provided in a joint surface between the metal plate and the ceramic base plate, wherein

a remaining amount of the release agent is less than 5 as an amount of boron measured by fluorescence X-ray analysis, and

an amount of crystal grain straining in the joint surface is equal to or less than 0.03%.

3. The base plate for a power module according to any one of claims 1 and 2, wherein

the metal plate is made of aluminum, and

the ceramic base plate is a plate made of any one of aluminum nitride and

silicon nitride.

4. A power module comprising:

the base plate for a power module according to any one of claims 1, 2, and 3; and

a semiconductor chip mounted on the metal plate of the base plate for a power module.

5. An Al/AlN joint material comprising;

an aluminum member;

an aluminum nitride member joined to the aluminum member; and

a brazing material provided between the aluminum member and the aluminum nitride member, wherein

the brazing material infiltrates in a porous layer on a surface of the aluminum nitride member, and

at least a portion of the brazing material forms a three-dimensional network structure within substantially equal to or more than 0.5 layers and equal to or less than three layers of a crystal structure of the aluminum nitride member.

6. The Al/AlN joint material according to claim 5, wherein

a diameter of the three-dimensional network structure is greater inside the aluminum nitride member than on a surface of the aluminum nitride member.

7. A base plate for a power module comprising;

an insulated base plate; and

a heat-releasing object provided on a first side of the insulated base plate, wherein

the insulated base plate is the Al/AlN joint material according to any one of claims 5 and 6.

8. A power module comprising:

the base plate for a power module according to claim 7; and

a chip which is mounted on a second side of the insulated base plate.

9. A power module comprising:

the base plate for a power module according to claim 7; and

a heat sink which is any one of air-cooled and water-cooled mounted on a second side of the insulated base plate.

10. A manufacturing method of an Al/AlN joint material, comprising:

a first step of obtaining an AlN sintering body having a porous layer on a surface thereof by sintering a powder of AlN; and

a second step of joining an Al member of the porous layer via a brazing material.

11. The manufacturing method of an Al/AlN joint material according to claim 10, further comprising

a third step of removing a weak porous layer formed on a surface of the AlN sintering body on which the Al member is joined, wherein

in the second step, the Al member is joined on the surface via the brazing material.

12. The manufacturing method of an Al/AlN joint material according to claim 11, further comprising

a fourth step of heating and pressurizing the AlN sintering body and the Al member under vacuum, with the brazing material being provided between the AlN sintering body and the Al member.

13. The manufacturing method of an Al/AlN joint material according to claim 12, wherein

in the fourth step, a joint surface is set in a vacuum, a liquid phase occurs in the brazing material by heating, and the liquid of the brazing material is infiltrated in a porous layer of the AlN sintering body.

14. The manufacturing method of an Al/AlN joint material according to any one of claims 12 and 13, wherein

in the second step, the Al member is joined to the AlN sintering body by allowing the brazing material to infiltrate the porous layer of the AlN sintering body by cooling and setting the liquid of the brazing material provided between the AlN sintering body and the Al member.